REMARKS

In the patent application, claims 1-24 are pending. In the office action, all pending claims are rejected.

Applicant has amended claim 2 to change "the decoder" to "a decoder" as suggested by the Examiner. Applicant has also amended claim 16 to correct for a typographical error.

No new matter has been introduced.

At section 2 of the office action, claim 2 is objected to because of informalities. Applicant has amended claim 2 to overcome the objection.

At section 4, claims 1-5, 7-12, 15, 17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Lee et al.* ("A very low bit rate speech coder based on a recognition/synthesis paradigm" IEEE Trans on Speech and Audio Processing, Vol. 9, No. 5, July 2001, hereafter referred to as *Lee*), in view of *Gao* (U.S. Patent No. 6,449,590).

In rejecting claims 1, 11, 17 and 20, the Examiner states that *Lee* discloses a method and system for improving coding efficiency having the following steps:

creating a plurality of simplified pitch contour segment candidates, each candidate corresponding to a sub-segment of the audio signal (Section V.A., pages 486-487);

measuring deviation between each of the simplified pitch contour segment candidates and the pitch values in the corresponding sub-segment; and

selecting a plurality of consecutive segment candidates to represent the audio segment (Section V.A., Pages 486-487; Figure 5); and

coding the pitch contour data in the sub-segments of the audio signal corresponding to the selected segment candidates (Section V. Page 486).

The Examiner admits that *Lee* fails to specifically suggest that the start and end points of a pitch contour sub-segment candidate may vary from that of the original speech sub-segment. The Examiner points to *Gao* for disclosing a means for time-warping the start and end points of a speech-sub-segment (col.2, line 17 to col. 43, line 14).

The Examiner states that it would be obvious for one skilled in the art to modify the approximation method used by *Lee* using the time-warping method in *Gao* in order to implement an efficient pitch contour coding process.

Applicant respectfully disagrees.

The speech coding process according to *Gao*

It is respectfully submitted that *Gao* discloses a method of speech processing wherein the encoder performs high-pass filtering and applies a perceptual weighting filter for providing weighted speech signal, and a pitch preprocessing operation is applied to warp the weighted speech signal in order to match the interpolated pitch values that will be generated by the decoder (col.5, lines 52 to 65). *Gao* uses high-pass filtering, perceptual weighting and speech signal warping to support lower bit-rate encoding modes. All these three steps are necessary to produce a linear pitch lag contour (see Figure 8c) from a non-linear pitch lag contour (Figure 8b). In fact, *Gao* discloses a method where the encoder generates a pitch lag contour by using estimates of a previous pitch lag and a current pitch lag of the speech signal and then warp the speech signal by temporally deforming the weighted speech signal in order to conform to the generated pitched lag contour (col.70, lines 47-53; col. 71, lines 10 – 17).

The speech coding process according to *Lee*

Lee discloses a method to substitute non-linear contour segments with linear contour segments. *Lee* simply picks a start point in the pitch contour and searches for an end point in the pitch contour that produces a linear segment having an error from the original contour segment smaller than d_{max}.

The differences between the approaches in *Lee* and *Gao*

Lee's coding method is contour-wise rather than frame-wise (last paragraph of left column on page 486). While *Gao* also discloses a method to substitute non-linear pitch lag contour segments with linear pitch lag contour segments, *Gao*'s coding method is frame-wise or subframe-wise (col. 42, lines 17 – 34). *Gao* uses high-pass filtering of the speech signal and a perceptual weighting filter for providing weighted speech signal. *Lee* does not use those steps.

There would be no motivation or incentive to combine the approaches in *Lee* and *Gao*

In order to raise a 103 rejection, the Examiner must show why a person skilled in the art would want to apply the method as disclosed in *Gao* to the method as disclosed in *Lee*. The Examiner fails to show such motivation.

There are many reasons why there would be no motivation to combine the approaches in *Lee* and *Gao*.

A. Complexity

As admitted by the Examiner, *Lee* uses the following four steps for pitch contour coding:

1) creating a plurality of simplified pitch contour segment candidates, each candidate corresponding to a sub-segment of the audio signal (Section V.A., pages 486-487);

2) measuring deviation between each of the simplified pitch contour segment candidates and the pitch values in the corresponding sub-segment; and

3) selecting a plurality of consecutive segment candidates to represent the audio segment (Section V.A., Pages 486-487; Figure 5); and

4) coding the pitch contour data in the sub-segments of the audio signal corresponding to the selected segment candidates (Section V. Page 486).

Gao uses a different approach in pitch contour coding. *Gao's* process involves at least three steps (col.5, line 52 – 64):

a) high-pass filtering the speech signal;

b) applying a perceptual weighting filter to the high-pass filtered speech signal for providing weighted speech signal, and

c) warping the weighted speech signal in order to match the interpolated pitch values that will be generated by the decoder.

None of the steps in *Gao* are used in *Lee*. Thus, in order to combine the method as disclosed in *Gao* to the method as disclosed in *Lee*, one must use all of the seven steps as shown above. The combined method requires a very complex encoder.

B. Compatibility

As mentioned earlier, *Lee's* coding method is contour-wise rather than frame-wise, whereas *Gao*'s coding method is frame-wise or subframe-wise. Furthermore, in order to time-warp the pitch lag contour, *Gao* requires applying a perceptual weighting filter to provide weighed speech signal. It is uncertain whether *Lee* can use the weighed speech signal to create a plurality of simplified pitch contour segment candidates, each candidate corresponding to a sub-segment of the weighted speech signal, and then measure the deviation between each of the simplified pitch contour segment candidates and the pitch values in the corresponding sub-segment.

C. *Lee* alone can accomplish what the combination of *Gao* and *Lee* may provide

Gao uses a time-warping method to replace non-linear pitch lag contour segments with linear pitch lag contour segments. The objective is to lower the coding bit-rate so as to meet a certain encoding mode.

Lee alone can lower the coding bit rate to meet a certain encoding mode by changing d_{max}. For example, if a high bit-rate is available, *Lee* may use a smaller d_{max} to improve the encoding accuracy. But when a lower bit-rate is required, *Lee* can use a larger d_{max} in order to reduce the number of linear pitch contour segments. There is no need to introduce three additional steps as required in *Gao*.

D. *Gao's* approach is not beneficial to the present invention

The present invention can lower the coding bit-rate to meet a certain encoding mode by changing the predetermined error value in the comparison step **508** as shown in the flowchart **500** of Figure 4 (p.11, lines 17 - 24). There is no need to use the time warping techniques as disclosed in *Gao*.

<u>*Lee*, in view of *Gao*, fails to render the present invention obvious</u>

In sum, *Lee* does not require the approach as used in *Gao* in order to meet a certain bit-rate requirement. The present invention does not require the approach as used in *Gao* in order to meet a certain bit-rate requirement. *Lee* and *Gao* may not be compatible to each other. Even if they are compatible, the combination of *Lee* and *Gao* yields an unnecessary complex encoding

system. The Examiner fails to show why a person skilled in the art would choose such a complex encoding system when a much simpler encoding system can achieve the same result.

For the above reasons, it is respectfully submitted that *Lee*, in view of *Gao*, does not render the invention as claimed in claims 1, 11, 17 and 20 obvious.

As for claims 2-5, 7-10, 12 and 15, they are dependent from claims 1 and 11 and recite features not recited in claims 1 and 11. For reasons regarding claims 1 and 11 above, it is respectfully submitted that claims 2-5, 7-10, 12 and 15 are also distinguishable over the cited *Lee* and *Gao* references.

At section 5, claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Lee*, in view of *Gao* and further in view of *Swaminathan et al.* (U.S. Patent No. 5,704,000, hereafter referred to as *Swaminathan*).

The Examiner cites *Swaminathan* for disclosing a means for selecting from a plurality of pitch candidates corresponding to pitch parameters of a specific pitch period.

It is respectfully submitted that claim 6 is dependent from claim 1 and recites features not recited in claim 1. For reasons regarding claim 1 above, claim 6 is also distinguishable over the cited *Lee*, Gao and *Swaminathan* references.

At section 6, claims 13-14, 16, 18, 19 and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Lee*, in view of *Gao* and further in view of *Lumelsky* (U.S. Patent No. 6,246,672).

The Examiner cites *Lumelsky* for disclosing a storage means for storing encoded audio data.

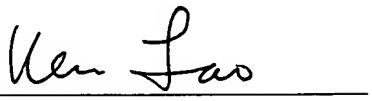
It is respectfully submitted that claims 13-14, 16, 18, 19 and 21-23 are dependent from claims 11, 17 and 20 and recites features not recited in claims 1, 11 and 20. For reasons regarding claims 1, 11 and 20 above, claims 13-14, 16, 18, 19 and 21-23 are also distinguishable over the cited *Lee*, *Gao* and *Lumelsky* references.

As for claim 24, it claims a communication network comprising a decoder as claimed in claim 17. For reasons regarding claim 17 above, it is respectfully submitted that claim 24 is also distinguishable over the cited *Lee*, *Gao* and *Lumelsky* references.

CONCLUSION

As amended, claims 1-24 are allowable. Early allowance of all pending claims is earnestly solicited.

Respectfully submitted,



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